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ABSTRACT

To determine the most appropriate use of interest scales in predicting college major at graduation, data from the Vocational Interest Inventory were analyzed. Subjects were 2,175 college graduates who had taken the inventory as high school juniors, and had graduated in one of 22 majors. The effects upon accuracy of classification and conceptual clarity of discriminant function results were compared, based on three different approaches to the sex composition of college major or criterion groups. On both grounds, naturally-occurring mixed-sex groups were preferred to either separate analyses by sex or to statistically balancing the sexes within major groups. (Author/CP)

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Sex Composition of Criterion Groups in the Discrimination of College Graduating Major Groups

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This study was based on data for 2,175 UW graduates who had completed the Vocational Interest Inventory in high school. At issue was the most appropriate use of interest information in predicting college major at graduation. Compared were the effects upon accuracy of classification and conceptual clarity of discriminant function results based on three different approaches to the sex composition of major or criterion groups. On both grounds naturally-occurring mixed-sex groups were preferred to either separate analyses by sex or to statistically balancing the sexes within major groups.

Project No. 622

Sex Composition of Criterion Groups in the Discrimination of College Graduating Major Groups

Important to the issue of sex bias in interest measurement is the sex composition of criterion groups, i.e., the numbers of men and women in different occupations or majors or intended vocations. Should separate reference groups be used for men and women as in the Strong-Campbell Interest Inventory (Campbell, 1977)? Can data for the sexes simply be pooled as in the discriminant function analysis of the ACT Interest Inventory (Hanson, 1974)? Or is there merit in statistically constructing criterion groups in which the sexes are equally represented? Harmon has said: "Groups used in developing scales should be composed of men and women in equal proportions or the effects of the two sexes should be statistically equalized (p. 62, 1975."

One of the principal ways of interpreting Vocational Interest Inventory or VII results (Lunneborg, 1977) makes use of a discriminant function (DF) analysis. Clients are told how closely their interest profiles resemble those of college graduates in eleven areas--Engineering, Nursing, Humanities, etc. These major groups have been naturally occurring ones, containing however many men and women graduated in them. This has meant that some groups were virtually of only one sex, while others were evenly sex-balanced.

The relatively small number of cases available for this first DF analysis (N = 552) precluded studying the sex composition question. Now, however, with data for three entering classes (Fall 1971, 1972, and 1973), it is possible to compare results of analyses based on single sex, mixed sex, and balanced sex groups.

The two most common bases for evaluating effectiveness of DFs are <u>accuracy of classification of cases</u> and <u>clarity</u> with respect to some <u>theoretical model</u> of the structure separating the groups. For example, in many studies using tests based on Holland's framework, researchers have been primarily concerned with finding the RIASEC structure in the occupations they were studying. Such conceptual clarity is essential to career guidance, making results more easily understood and credible.

The purpose of the present study was to evaluate three approaches--single, mixed, and balanced--to discriminating the interests of groups of graduating college majors using the above criteria of classification accuracy and conceptual clarity. Whichever approach met the two criteria best would be selected for future use in VII feedback.

Method

Subjects. Among University of Washington graduates from June 1975 through June 1977, 2,175 were found who had both taken the VII as high school juniors and graduated in one of the 22 majors listed in Table 1 (1,237 males, 938 females). These majors have been restricted to those in which there were at least 50 cases (with one exception, Foreign Languages and Literature with 48).

The first eleven groups listed in Table 1 contain sizable numbers of each sex (at least 18 subjects) and this set of majors is referred to as "common majors." Fourteen majors contain at least 30 males and this set will be called "male majors." Fifteen majors had at least 30 females and this set will be called "female majors" in describing results.

Analyses. Five DF analyses using VII scores were conducted:

(1) total set of 22 groups with pooled sex data
(2) 11 common majors with pooled sex data
(3) 11 common majors with means and covariances balanced to give equal representation to the sexes
(4) 14 male majors, male data only
(5) 15 female majors, female data only

In each analysis at least four significant discriminant functions were obtained. To insure comparability of results, four DFs were rotated in each analysis. Rotations were all to a varimax criterion based on the correlations of the four DFs with the VII scores in a normative sample of 5,000 high school juniors tested 1973 (Lunneborg, 1977). This reference group is an appropriate choice because it is this population for which VII results are primarily intended. This group has approximately equal numbers of the sexes.

All DF analyses except (3), the statistically sex-balanced one, were carried out using the SPSS discriminant routine. Special programs were

Table 1

Number of Graduates in Major Areas Employed in the DF Analyses

Major	N_{male}	N_{female}	N_{total}	Common major	Male major	Female major
Communications	53	51	104	X	X	X
English	31	47	78	X	X	X
History	31	30	61	X	X	X
Psychology	58	92	150	X	X	X
Business Administration	191	82	273	X	X	X
Accounting	89	33	122	X	X	X
Mathematics	37	18	55	X	X	
Political Science	42	18	60	X	X	
Sociology	22	43	65	X		X
Biological Sciences	146	68	214	X	X	X
Social Services	19	49	68	X		X
Economics	74	11	85		X	
Urban & Environ. Planning	39	12	51		X	
Physical Sciences	72	8	80		X	
Fisheries/Forestry	54	14	68		X	
Engineering	223	17	240		X	
Foreign Lang/Lit	12	36	48			X
Art	14	42	56			X
Home Economics	1	50	51			X
Nursing	0	105	105			X
Speech Studies	14	48	62			X
Health Professions	15	63	78			X

written employing IMSL subroutines for the remaining discriminant analysis and for all rotations.

Results

Table 2 presents VII profiles for the 22 majors. VII standard scores are based on a mixed-sex norm group. Because of this, unfortunately, sex differences may result. Women in Business and Accounting were less interested in BUS than the men in these areas; men in Biological Science were more interested in TEC and less in ART than the women in this area. In contrast, when raw scores are standardized separately for the sexes, as in the ACT analyses, such profiles appear far more alike. Because men and women in the same majors had similar profiles once separately standardized, ACT combined the sexes in their DF criterion groups and report mixed-sex DF results. ACT's criterion groups might be called "pseudo-natural" in that they were not sex-balanced, e.g., Political Science had 301 males and 83 females, and exclude majors with fewer than 75 graduates. ACT thus uses some extremely unbalanced majors such as Engineering and Art Education that represent just one, sizable sex group (Hanson, 1974, p. 32).

Table 2

Mean VII Standard Score Profiles for Graduates in 22 Majors

	VII scales															
	SER		BUS		ORG		TEC		OUT		SCI		CUL		ART	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Communications																
Males (N = 53)	46	11	55	12	50	12	49	11	45	13	46	11	53	12	48	12
Females (N = 51)	50	9	51	11	51	9	43	8	46	11	47	11	57	12	55	9
English																
Males (N = 31)	47	8	52	11	50	11	49	7	45	10	47	12	57	11	52	10
Females (N = 47)	52	8	45	9	48	11	44	7	50	7	49	10	58	11	55	11
History																
Males (N = 31)	46	9	51	9	50	11	49	8	48	10	48	11	60	10	49	9
Females (N = 30)	53	9	48	11	46	9	44	7	52	10	46	9	59	10	54	7
Psychology																
Males (N = 58)	50	10	51	10	47	12	51	7	47	9	56	13	49	10	48	8
Females (N = 92)	54	9	48	10	51	11	44	7	49	9	52	9	53	10	51	9
Business																
Males (N = 191)	45	9	54	10	54	11	53	8	46	10	50	9	50	10	47	10
Females (N = 82)	50	8	50	10	58	11	45	7	47	11	48	11	52	8	49	10
Accounting																
Males (N = 89)	43	10	53	11	56	11	52	7	46	9	51	11	51	9	46	9
Females (N = 33)	51	8	47	11	58	9	47	5	44	11	50	10	57	10	47	10

Table 2 (cont'd)

	SER		BUS		ORG		TEC		OUT		SCI		CUL		ART	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Mathematics																
Males (N = 37)	43	9	50	11	51	10	54	8	47	9	56	11	51	10	45	8
Females (N = 18)	50	7	41	11	51	11	46	7	49	7	57	10	53	10	51	9
Political Sci																
Males (N = 42)	46	8	56	12	53	11	50	7	45	10	48	10	56	10	46	9
Females (N = 18)	50	10	54	10	54	10	42	7	49	11	44	10	59	10	49	11
Sociology																
Males (N = 22)	49	7	48	13	50	10	47	7	49	12	49	14	59	9	49	10
Females (N = 43)	54	7	47	9	49	10	44	6	51	9	51	8	52	9	52	8
Biol Science																
Males (N = 146)	46	8	45	9	47	9	52	8	50	9	63	8	49	9	46	10
Females (N = 68)	49	9	42	10	46	10	46	8	53	10	59	10	51	9	52	10
Social Serv																
Males (N = 19)	49	6	53	9	51	9	53	8	49	11	52	11	50	10	43	13
Females (N = 49)	57	8	48	11	49	9	43	7	48	10	50	10	57	10	49	9
Male Unique Areas																
Econ (N = 74)	45	8	53	12	53	12	51	7	47	12	50	11	54	11	45	11
UDesign (N = 39)	43	9	48	11	53	11	53	8	47	10	53	12	49	12	54	9
PhySci (N = 72)	44	8	46	10	49	10	55	8	49	10	59	9	51	9	46	8

Table 2 (cont'd)

	SER		BUS		ORG		TEC		OUT		SCI		CUL		ART	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Fish/For (N = 54)	45	8	46	9	46	9	51	7	59	10	59	9	46	9	46	10
Engineer (N = 223)	43	9	46	10	52	10	58	9	46	10	57	10	49	10	45	10
Female Unique Areas																
Lang/Lit (N = 36)	51	7	45	11	49	11	46	6	52	9	49	10	52	9	56	8
Art (N = 42)	49	7	47	10	45	8	48	8	50	10	48	10	50	10	63	8
Home Ec (N = 40)	52	10	47	10	51	9	46	7	50	11	51	9	50	11	54	8
Nursing (N = 105)	54	8	43	9	49	8	46	7	51	10	59	9	50	9	49	9
Speech (N = 48)	53	9	48	10	50	9	45	7	49	10	49	8	54	8	53	10
Health (N = 63)	55	8	46	10	48	11	45	7	50	11	54	9	51	9	50	10

Overall accuracy of classification. A statistic frequently associated with DF results is percent trace indicating relative importance to group discrimination of successive DF's. Since the first DF is necessarily that combination of the eight VII scores which best discriminates among major groups, the first DF always has the largest percent trace. For the same reason successive DFs will have increasingly smaller trace scores, i.e., they will account for progressively less of between-group differences. The percent trace for the five discriminant functions are given below.

Table 3

Summary of DF Results

	Percent trace				% cases correctly classified	% cases correctly classified by chance
	1	2	3	4		
(1) total	44.8	28.9	10.5	6.2	18	4.5
(2) common	46.8	21.6	14.3	8.4	24	9.0
(3) balanced	58.2	19.4	13.7	5.2	20	9.0
(4) male	53.4	24.4	8.2	5.7	22	7.1
(5) female	38.3	29.7	16.2	7.3	21	6.6

Percent trace reflects only the relative importance of the functions; it says nothing about the absolute ability of a set of DFs to account for between-group differences. Ideally, this ability is assessed using a cross-validation group: how accurately would the DFs defined on the present sample predict graduating major for future classes?

A cross-validation sample is unavailable, therefore accuracy of classification can be assessed only by looking at the number of graduates in this sample correctly classified by the five sets of DFs. How did they compare to one another? Given in Table 3 with percent trace are percent cases correctly classified and the percent for each analysis that would have resulted by chance alone. Keeping this chance figure in mind, the lowest percent correct (18% for the total set) becomes as "good" as the other groups. These correct classification percents are comparable to the cross-validation results for the earlier VII DFs, 23%, and with the results for

the ACT II, 14% in cross-validation across 24 major groups (Lunneborg, 1977).

Three conclusions are suggested. (1) The use of separate sex groups resulted in no greater accuracy than that obtained by pooling the sexes (analysis 4 and 5 vs. 2). (2) Sex-balanced criterion groups do not appear any more accurate than naturally occurring groups (analysis 3 vs. 2). (3) If one were to select the set of majors on which to base the discriminant analysis solely on accuracy, the total set of 22 would be the wisest choice. Here clients receive a larger number of majors to think about, with no real loss of accuracy of prediction.

Individual accuracy of classification. Table 4 makes it clear that individual accuracy of prediction varied widely. The most accurately predicted groups appear to be History, Political Science, Fisheries/ Forestry, Engineering, Art, and Nursing. The most poorly predicted majors were seven: English, Psychology, Business Administration, Mathematics, Sociology, Physical Science, and Speech Studies. How were these latter classified instead? Do the misclassifications "make sense" or are they inappropriate?

1. English majors got misclassified as History and Art.
2. Psychology as Nursing, Social Service, Health Profs, and Biological Science (particularly true for women).
3. Business Administration as Accounting, Political Science, and Engineering.
4. Mathematics as Engineering, Fisheries/Forestry, and the Physical and Biological Sciences.
5. Sociology as History, Home Economics, and Nursing.
6. Physical Science as Biological Science, Fisheries/ Forestry and Engineering.
7. Speech Studies as Art, Nursing, and Foreign Lang/Lit.

Some of these majors are obviously closely related to the correct major and would not produce grossly misleading guidance. Others should be considered carefully before being included in a final set for use with counseling clients.

Clarity of theoretical model. The second criterion for deciding which DF analysis to use in career guidance is the clarity of the underlying dimensions that discriminate the majors. The factor structure of the VII consists of three bipolar factors--Service vs. Technical, Business contact

Table 4

Individual Group Accuracy of Prediction Using Five Different Sets of Majors in the Discriminant Analyses

	Discriminant analyses				
	% Total (1)	% Common (2)	% Balanced (3)	% Male (4)	Female (5)
Communications	10	14	12	08	32
English	08	21	16	23	17
History	20	30	28	32	27
Psychology	00	17	10	28	02
Business Adm	08	17	08	10	23
Accounting	14	21	30	14	36
Mathematics	00	13	14	08	
Political Sci	22	22	21	12	
Sociology	05	17	13		07
Biological Sci	16	49	45	26	40
Social Services	13	21	18		25
Economics	11			03	
Urb/Env Planning	08			26	
Physical Sciences	08			04	
Fisheries/Forest	43			54	
Engineering	49			43	
Foreign Lang/Lit	21				09
Art	49				44
Home Economics	12				08
Nursing	34				31
Speech Studies	05				02
Health Profs	11				08

vs. Science, Organization vs. Outdoor--and a fourth factor which may be bipolar with Art at one end and Detail work at the other (Lunneborg, 1977).

Table 5 presents the correlations of VII scales with the four rotated DFs for the normative sample of high school juniors. Table 5 can be interpreted in much the same way as the factor loadings that result from a rotation in factor analysis.

In the total group analysis SER vs. TEC and ART were clearly defined. BUS vs. SCI and ORG vs. OUT appeared as well but were fused. Thus, in the first 3 factors, the seven scales previously identified with the structure of the VII were represented. The fourth factor was defined by the eighth VII scale, CUL, and turns up because of the inclusion of many general cultural majors.

In the common and balanced analyses the same picture emerged. The opposition of ART to ORG and to TEC in these two analyses is certainly more like an Art vs. Detail factor than ART vs. SCI in the total analysis.

In the male analysis SER vs. TEC and BUS vs. SCI were defined. ORG vs. OUT and ART were not. Instead, OUT and CUL defined factors by themselves. In the female analysis BUS vs. SCI and ORG vs. OUT appeared but were fused. After that the typical factor structure to the VII was not found. SER and CUL defined factors by themselves (first and last), while ART was in opposition to ORG and SCI.

The following conclusions can be made: (1) The separate sex analyses are inferior to the mixed sex analyses so that consideration can be limited to the first three. (2) The SER vs. TEC factor is best defined in the total analysis. (3) BUS vs. SCI is probably best defined in the common analysis. (4) Art vs. Detail is probably best defined in the balanced analysis. (5) The balanced analysis makes the fourth factor most nearly General Cultural.

These conclusions, together with those having to do with accuracy of classification, suggest the choice of analysis for future DF guidance feedback should be the <u>total analysis</u>. It offers clients the greatest number of majors with which to compare themselves, while best reflecting in its first three functions the established dimensions to the VII. Further, regarding the issue of the appropriate sex composition of criterion groups, there was no advantage here in classification or clarity

Table 5

Correlations of VII Scales with the Four Rotated DF's

for Five Analyses

(Decimal points omitted)

	VII scales	Rotated DFs 1	2	3	4
Total analysis	SER	83	07	-12	-10
	BUS	13	56	01	37
	ORG	01	73	-17	-08
	TEC	-78	16	-10	-33
	OUT	-01	-59	03	08
	SCI	03	-63	-46	-48
	CUL	13	-05	-14	75
	ART	-03	-14	94	-16
Common analysis	SER	-95	04	-20	01
	BUS	08	-65	-28	01
	ORG	16	-61	-37	16
	TEC	57	-09	-40	14
	OUT	-02	43	-02	-12
	SCI	09	80	-04	50
	CUL	-05	09	-02	-82
	ART	04	-11	73	05
Balanced analysis	SER	96	09	21	-01
	BUS	01	-81	-00	15
	ORG	-33	-58	52	-25
	TEC	-46	29	32	17
	OUT	09	40	-28	42
	SCI	-14	57	15	33
	CUL	10	02	-06	-92
	ART	-12	-03	-79	-30
Male analysis	SER	-61	10	-30	02
	BUS	-19	-75	-21	11
	ORG	24	-52	-11	14
	TEC	81	-00	-25	25
	OUT	-01	24	86	06
	SCI	-10	82	-08	45
	CUL	-04	12	-21	-86
	ART	-15	-06	13	-25
Female analysis	SER	-98	-05	-06	-09
	BUS	06	63	05	-03
	ORG	24	70	-54	10
	TEC	27	-02	07	47
	OUT	01	-44	12	01
	SCI	10	-81	-41	21
	CUL	09	07	-08	-93
	ART	13	01	84	19

to performing separate analyses for the sexes, to statistically balancing the sexes within groups, or to restricting the criterion groups to those in which both sexes are sizably represented.

Final Recommendation

To provide an operational set of DF results the total analysis was repeated with two changes. (1) The seven poorly predicted major groups were eliminated, leaving fifteen. (2) Three rather than four discriminant functions were rotated in an attempt to define a structure more closely related to the factorial composition of the VII.

The percent trace for the first four DFs for this final set of 15 majors was: 42.1, 30.8, 12.1, and 6.9. The first three thus accounted for 85% of the between group differences. Table 6 presents the classification data for these 1,405 graduates. Overall 27% of cases were correctly identified ranging from 10% for COMMUNICATIONS and HEALTH PROFESSIONS to 53% for ENGINEERING. In the original validation sample with eleven major groups, 9% accuracy was expected by chance with 30% of cases correctly classified. This time with 7% of cases correctly classified by chance, 27% accuracy is slightly better.

Table 7 presents the mean scores for the groups for each VII scale. The high and low groups attest to the construct validity of the scales. Table 8 gives the correlations between VII scores and the rotated DFs. DF 1 is clearly SER vs. TEC, DF 2 is BUS vs. SCI, and DF 3 is Detail work vs. ART.

Table 6

Frequencies for Predicted Major Groups in 1405 Baccalaureates Based on Three VII Discriminant Functions

Actual group		%	Predicted group 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	COMMUN	10	10	10	6	12	4	4	16	0	3	8	7	2	7	4	9
2	HISTORY	23	1	14	1	6	0	3	10	1	1	1	9	0	4	4	6
3	ACCTG	20	2	5	25	4	5	1	19	9	8	7	8	3	4	18	4
4	ART	47	2	4	0	26	1	4	0	2	0	2	0	5	2	4	3
5	ECON	11	2	8	11	2	9	1	11	3	4	3	4	3	10	10	4
6	HOME EC	14	3	1	2	6	1	7	0	6	3	2	6	4	1	3	6
7	POL SCI	25	4	11	8	4	2	1	15	1	2	3	4	0	2	3	0
8	NURSING	36	1	3	0	9	1	6	1	38	14	1	7	8	10	4	2
9	BIO SCI	21	0	10	6	17	1	0	4	31	45	4	5	4	37	40	9
10	URB PLAN	12	3	1	3	9	0	0	3	1	6	6	4	0	3	7	4
11	SOC SER	13	4	6	2	4	2	9	4	5	3	0	9	7	2	7	4
12	HEALTH	10	0	3	3	5	1	7	5	15	6	2	7	8	5	3	9
13	FISH/FOR	47	2	3	1	7	0	3	1	4	6	0	0	0	32	7	2
14	ENGINEER	53	1	4	14	9	6	3	7	7	28	8	3	1	20	127	1
15	FOR LANG	23	2	5	5	7	0	3	1	3	5	0	2	1	0	2	11

Note. Underlined are the "correct" majors. Correctly classified were 27% of cases. Individual group accuracy appears in the first column under %.

Table 7

Ordering of the Fifteen Major Groups by Mean Scores on VII Scales

			VII scales				
SER	BUS	ORG	TEC	OUT	SCI	CUL	ART
SOC SER (55)	POL SCI (55)	ACCTG (57)	ENGINEER (58)	FISH/FOR (59)	BIO SCI (62)	HISTORY (60)	ART (62)
HEALTH (54)	COMMUN (53)	POL SCI (53)	URB PLAN (51)	FOR LANG (51)	NURSING (59)	POL SCI (57)	FOR LANG (55)
NURSING (54)	ECON (52)	ECON (53)	FISH/FOR (50)	NURSING (51)	FISH/FOR (58)	SOC SER (55)	URB PLAN (54)
HOME EC (52)	ACCTG (52)	ENGINEER (52)	ACCTG (50)	BIO SCI (51)	ENGINEER (57)	ECON (55)	HOME EC (54)
FOR LANG (50)	HISTORY (50)	URB PLAN (52)	ECON (50)	ART (51)	HEALTH (55)	COMMUN (55)	HISTORY (51)
HISTORY (50)	URB PLAN (49)	COMMUN (51)	BIO SCI (50)	HISTORY (50)	URB PLAN (51)	FOR LANG (55)	COMMUN (51)
COMMUN (48)	SOC SER (49)	HOME EC (51)	ART (49)	HOME EC (50)	HOME EC (51)	ACCTG (53)	HEALTH (50)
POL SCI (47)	ART (47)	SOC SER (50)	POL SCI (47)	HEALTH (49)	ACCTG (51)	HOME EC (51)	NURSING (49)
BIO SCI (47)	HEALTH (47)	FOR LANG (49)	HEALTH (47)	SOC SER (48)	SOC SER (51)	URB PLAN (50)	BIO SCI (48)
ART (47)	HOME EC (47)	NURSING (49)	HOME EC (46)	ECON (47)	ECON (50)	HEALTH (50)	SOC SER (47)
ECON (46)	ENGINEER (45)	HEALTH (48)	COMMUN (46)	URB PLAN (47)	ART (50)	NURSING (50)	POL SCI (47)
ACCTG (45)	FISH/FOR (46)	HISTORY (48)	HISTORY (46)	POL SCI (46)	FOR LANG (49)	BIO SCI (50)	FISH/FOR (47)
FISH/FOR (45)	FOR LANG (45)	BIO SCI (47)	SOC SER (46)	ENGINEER (46)	POL SCI (47)	ART (49)	ACCTG (46)
URB PLAN (45)	BIO SCI (44)	FISH/FOR (46)	NURSING (46)	COMMUN (46)	COMMUN (47)	ENGINEER (49)	ECON (46)
ENGINEER (43)	NURSING (43)	ART (45)	FOR LANG (45)	ACCTG (45)	HISTORY (47)	FISH/FOR (46)	ENGINEER (45)

Note. Groups ranged in size from 47 for FOR LANG to 239 for ENGINEER.

Table 8

Correlations between VII Scores and the Rotated Discriminant Functions Based on the Final Set of 15 Majors

(Decimal points omitted)

VII scales	Function 1	2	3
SER	77	12	17
BUS	-11	64	07
ORG	-00	44	44
TEC	-86	-08	16
OUT	04	-38	-24
SCI	-01	-86	24
CUL	29	46	14
ART	-05	01	-91

Table 9 gives the centroids or averages for each of the fifteen groups on the three rotated functions. On DF 1, SER vs. TEC, Social Service majors were highest and Engineering majors lowest. On DF 2, BUS vs. SCI, Political Science was highest and Biological Science lowest. And on DF 3, Detail work vs. ART, Engineering and Art were at the extremes. Weights to be used in conjunction with VII standard scores to compute individual rotated discriminant function scores are given in Table 10. The individual's rotated DF scores may then be compared with the centroid for each of the 15 groups by computing a sum of squared differences over the three functions using Table 9. The individual profile is closest to the major centroid for which this sum of squared differences is smallest. This is the form in which the Washington Pre-College Testing Program presents DF feedback--the individual's closest three major groups are given in a "similarity report."

The VII (Lunneborg, 1977) instead uses simple difference scores corresponding to the three bipolar factors underlying the VII together with the Art score to compare testtakers to college graduate groups. Figure 1 will

replace the current so-called Dimension Score Profile which arrayed the original eleven groups on SER vs. TEC, BUS vs. SCI, ORG vs. OUT, and ART.

These new DF results are recommended over the earlier analyses because they are more recent, span a larger and more representative sample of University graduates, and provide data based on more major groups. Additionally, we now know that naturally-occurring criterion groups such as these have advantages over restricting the groups used to those with both sexes sizably represented or artifically balanced.

Table 9

Average Rotated Discriminant Function Scores for the Final Set of Fifteen Groups

Group	Function		
	First	Second	Third
COMMUN	50.77	55.28	48.69
HISTORY	52.36	54.96	47.88
ACCTG	47.22	52.64	55.42
ART	48.28	48.32	38.01
ECON	47.54	53.25	54.43
HOME EC	53.54	48.31	47.28
POL SCI	50.16	56.89	52.75
BIO SCI	47.89	40.47	52.35
NURSING	54.62	41.62	52.08
URB PLAN	46.22	50.17	47.67
SOC SER	55.21	50.82	53.00
HEALTH	53.96	45.61	50.72
FISH/FOR	47.31	41.28	50.20
ENGINEER	40.67	45.03	56.79
FOR LANG	53.34	50.00	45.25

Note. This table can be used in conjunction with the table of rotated discriminant weights (Table 10) to determine the closeness of an individual's rotated DF scores to each of the majors.

Table 10

Rotated Discriminant Function Weights for VII Standard Scores

	Weights		
VII scale	1	2	3
SER	.59	-.11	.15
BUS	.02	.31	-.04
ORG	.11	.10	.26
TEC	-.61	-.02	.20
OUT	.13	-.13	-.20
SCI	.02	-.64	.17
CUL	.06	.32	.06
ART	.04	-.04	-.81
Additive constant	32.24	60.59	60.51

Dimension (Difference plus 50) Scores on Four College Graduate Dimensions for 15 College Majors

	Service	Business	Organization	Art	
65					65
-					-
-					-
-				Art (62)	-
-			Acctg (61)		-
60					60
-	Soc Ser (59)				-
-	Nursing (58)	Pol Sci (58)			-
-	Health (57)		Pol Sci (57)		-
-	Home Ec (56)	Commun (56	Econ (56) Engineer (56)		-
55	For Lang (55)		Urb Plan (55) Commun (55)	For Lang (55) Urb Plan (54) Home Ec (54)	55
-					-
-	History (53)	History (53)			-
-	Commun (52)	Econ (52)	Soc Ser (52)		-
-		Acctg (51)	Home Ec (51)	Commun (51) History (51)	-
50	Pol Sci (50)		Health (50)	Health (50)	50
-				Nursing (49)	-
-	Art (47)	Urb Plan (48) Soc Ser (48)	History (48) For Lang (47)	Bio Sci (48) Soc Ser (47)	-
-	Bio Sci (47)	Art (47)	Nursing (47)	Pol Sci (47)	-
-	Econ (46)	For Lang (46)	Bio Sci (46)	Fish/For (46)	-
45	Fish/For (45) Acctg (45)	Home Ec (45)		Acctg (46) Econ (45)	45
-	Urb Plan (44)		Art (44)	Engineer (45)	-
-					-
-		Health (42)			-
-					-
40					40
-					-
-		Engineer (38)			-
-		Fish/For (37)	Fish/For (37)		-
-					-
35	Engineer (35)				35
-		Nursing (34)			-
-					-
-		Bio Sci (32)			-
-	Technical	Science	Outdoor	Detailed Work	-

Figure 1

References

Campbell, D. P. Manual for the SVIB-SCII (2nd ed.) Stanford, CA: Stanford University Press, 1977.

Hanson, G. R. Assessing the career interests of college youth: summary of research and applications. ACT Research Report No. 67. Iowa City, Iowa: The American College Testing Program, 1974.

Harmon, L. W. Technical aspects; problems of scale development, norms, item differences by sex, and the rate of change in occupational group characteristics--1. In E. E. Diamond (Ed.) Issues of sex bias and sex fairness in career interest measurement. Washington, D. C.: National Institute of Education, 1975.

Lunneborg, P. W. Vocational Interest Inventory Counselor's Manual. Seattle, WA: Career Decision Consultants of Seattle, 1977.